Table VI.

H.	January, 1898.		Mean $\alpha \cdot 10^6$ obs.	$\left(\bar{\alpha} - \frac{\delta l}{l}\right)10^6$.	$I^6 \cdot 10^{-13}$.
	I.	$\frac{\delta l}{l} \cdot 10^6$ calc.			
35	258	−3·7	−5·30	−1·6	29·5
60	323	−5·5	−10·1	−4·6	114·0
80	359	−6·45	−13·6	−7·2	214·0
100	385	−7·05	−16·7	−9·6	326·0
125	409	−7·1	−20·2	−13·1	468·0
150	426	−6·7	−23·1	−16·4	598·0
175	440	−6·3	−25·5	−19·2	726·0
200	450	−5·5	−27·5	−22·0	830·0
225	458	−4·65	−29·05	−24·4	923·0
250	463	−4·2	−30·4	−26·2	986·0
275	468	−3·8	−31·6	−27·8	1050·0
310	473	−3·5	−32·9	−29·4	1120·0

"Upon the Structure and Development of the Enamel of Elasmobranch Fishes." By CHARLES S. TOMES, M.A., F.R.S. Received February 7,—Read February 17, 1898.

(Abstract.)

The nature of the hard polished outer layer of the teeth of this group of fishes has been from time to time a subject of discussion, some authors holding that it is enamel, whilst others deny its claim to be so styled.

The author describes its physical, chemical, and histological peculiarities, calling attention to its hardness, its optical properties, its almost entire solubility in weak acids, and to its tubularity, in all of which respects it resembles unquestionably an enamel.

But it contains lacunar spaces, and presents a very distinct lamination, parallel, or nearly so, with its surface, in which respect it is unlike an enamel.

Still upon the balance of its characters it has much more in common with enamel than with dentine, from which it is sharply marked off by the entire absence of any collagen basis.

It is also shown that the tubular structure, which may be regarded as typical in these fish, passes by insensible gradations into a simple tissue differing but little from an ordinary enamel; this is especially the case where the whole layer is thin, as in the Rays. But the study of its development raises the difficulty afresh.

Each dentine papilla forms upon its surface a specialised layer which is derived from spindle-shaped cells, sending out immensely elongated processes which run nearly parallel with the surface. There is a large amount of intercellular substance formed so that the cell processes ultimately become inconspicuous, and a lamination or fibrillation of this layer only remains; in this stage it is exceedingly resistant to staining.

The layer is also permeated by cell processes which run through it at right angles to its surface, and these persist. It is found that this layer is the site of the so-called enamel formation, the first named cell processes giving rise to its lamination, and the last mentioned cell processes giving rise to the tube system which permeates it.

In all mammals dentine calcification commences at the very outside of the dentine papilla, and nothing at all corresponding to this specialised layer exists at any period.

But in the Elasmobranch fishes the calcification of the dentine, whether it be an osteodentine as in *Lamna* or a fine-tubed dentine as in most others, does not take place at the outer surface of the entire dentinal papilla, but along the deeper side of the specialised layer, thus soon cutting it off from any free communication with the body of the pulp.

This layer, in the extent to which it is developed, bears a ratio to the thickness of the ultimate "enamel." Over it lie the columnar epithelial cells of the enamel organ, which present several peculiarities; they are found to grow to three or four times their original size quite suddenly; that is to say, on one tooth germ they are small, on the very next they are enormous, and this is the tooth germ in which the specialised layer has attained to its maximum. Then on the next older germ the ameloblasts have fallen to their original size, and have lost their distinctness of outline.

The great growth of these cells just at one particular stage of tooth development, their subsequent immediate atrophy, and the fact that their length bears also a direct ratio to the thickness of the enamel formed, renders it impossible to suppose that they can be functionless, and it is suggested that they furnish the lime salts for the calcification of the specialised layer of the dentine papilla before alluded to, there being difficulties in the way of supposing that the dentine papilla does so.

In that case the disputed enamel layer of the finished tooth does not correspond precisely either to the enamel or to the dentine of the completed mammalian tooth, but is a joint product of the epiblastic enamel organ and the mesoblastic dentine papilla.

The general conclusion arrived at is that, just as the whole teeth of the Elasmobranchs present the simplest known form of tooth

development, so do they also present the first introduction of enamel as a separate tissue.

In its first introduction it was a joint product, made under circumstances which almost precluded any slow and gradual formation of an outer layer upon the teeth; but in the further specialisation of teeth in reptiles and mammals the tooth germs sink more deeply into the submucous tissue, and are protected for a much longer time.

The enamel organs become more specialised, and finally take upon themselves the entire work of enamel building, manufacturing both the organic matrix and furnishing it with lime salts, as unquestionably happens in mammals.

And if these conclusions be correct, it would be quite justifiable to call it enamel, even though the dentine papilla has had a share in its production.

"On Apogamy and the Development of Sporangia upon Fern Prothalli." By WILLIAM H. LANG, M.B., B.Sc., Lecturer in Botany, Queen Margaret College, and "G. A. Clark" Scholar, Glasgow University. Communicated by Professor F. O. BOWER, Sc.D., F.R.S. Received February 28,—Read March 3, 1898.

(Abstract.)

The two most important deviations from the normal life-history of ferns, apogamy and apospory, are of interest in themselves, but acquire a more general importance from the possibility that their study may throw light on the nature of alternation of generations in archegoniate plants. They have been considered from this point of view by Pringsheim, and by those who, following him, regard the two generations as homologous with one another in the sense that the sporophyte arose by the gradual modification of individuals originally resembling the sexual plant. Celakovsky and Bower, on the other hand, maintain the view that the sporophyte, as an interpolated stage in the life-history arising by elaboration of the zygote, is not the homologue of the gametophyte, and is only represented in a few thallophytes. In the light of the theory of antithetic alternation no weight is attached to apogamy and apospory for phylogenetic purposes.

In the paper of which this is an abstract the results obtained by cultivating the prothalli of a number of species of ferns under conditions slightly different from the natural ones are described, and their bearing on the problem of the nature of alternation considered. The behaviour of *Scolopendrium vulgare*, Sm., and *Nephrodium dilata-*